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Cavity Ring-Down Spectroscopy Lite: A Low Power Analyzer for measuring Carbon Dioxide, Methane and Water Vapor

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Greenhouse gas accumulation has contributed to the changes in environments across the globe. Monitoring these fluctuations on global and local scales will allow scientists to better understand contributions that are made from nature and humans. This has led to the deployment of analytical instrumentation of all types to the most remote areas as well as the most densely populated areas. This however requires instruments to be precise, versatile, robust, and most importantly have power requirements that are as not limited by location, i.e. low enough power consumption to run off of batteries or even solar array.

Here we present a full greenhouse gas analyzer that utilizes a new method of CRDS to measure carbon dioxide, methane and water vapor that consumes only 25W and still maintains long term stability to allow for averaging time of over 3 hours. Measurements have a 1-σ precision of 30 ppb for CO_2 and 300 ppt of CH_4 with 5 minutes of averaging; and with measurements of 3 hour averages reaching precisions down to 40ppt of methane. Additionally this new flavor of CRDS has allowed for an overall increase in measurement dynamic range from traditional CW-CRDS measuring methane up to 1000ppm and carbon dioxide up to several percent. We will present supplemental data acquired using this $<$11 kg analyzer, including soil respirations using closed static chambers and 10m tower measurements from Santa Clara, CA.